

## Chapters 7 and 8

### Bond Polarity

- ↳ Determined by electronegativity.
- ↳ Ability of an atom to attract another atom's electrons.

EX:  $\text{H} \xrightarrow{\quad} \text{F}$

electronegativity  
 $\text{H} - \text{F}$   
2.1    4.0

F is more electronegative than H  
So electrons spend more time around the F. The bond is now polar.  
F is a little (-) and H is a little (+).

Dipole - Bond with slightly (+) and (-) ends

↳ (Polar Bonds)

### Trends in electronegativity

- ↳ Down a Group, electronegativity goes down.  
As the atoms get bigger down a group so the neighboring atoms electrons are farther away and less attracted.
- ↳ Across a Period, electronegativity goes up.  
More protons in the nucleus attract more electrons.
- Difference of electronegativity will determine the bond type.

↳ Big Difference → Ionic 1.7 ↑

Medium Difference → Polar Covalent 0.3-1.7

Small Difference → Non polar covalent 0.0-0.3

### Shapes of Molecules (3-Dimensional)

- ↳ electron domains are going to repel each other to be as far apart as possible.

2D ↳ ex:  $\text{H} - \text{C} - \text{H}$  90° bond angle  
           $\text{H} \quad \text{H}$   
           $\text{H} \quad \text{H}$   
          ↳ electron domain

3D ↳ ex:  $\text{H} - \text{C} - \text{H}$  Tetrahedral  
           $\text{H} \quad \text{H}$

# VSEPR Model

Valence

Shell electron Pair Repulsion

VSEPR  
Geometry

Molecule  
Type

# of unshared  
electron pairs  
central atom (non bonding  
domain)

Bond  
Angle

Example

|                    |           |   |               |  |
|--------------------|-----------|---|---------------|--|
| Linear             | $A_2$     | 0 | $180^\circ$   | $H_2: H-H$<br>$HCl: H-\ddot{Cl}:$  |
| Linear             | $AB_2$    | 0 | $180^\circ$   | $HCN: H-C \equiv N:$   |
| Trigonal Planar    | $AB_3$    | 0 | $120^\circ$   | $BH_3: \begin{array}{c} H \\   \\ B \\ / \backslash \\ H \end{array}$        |
| Tetrahedral        | $AB_4$    | 0 | $109.5^\circ$ | $CH_4: \begin{array}{c} H \\   \\ H-C-H \\   \\ H \end{array}$               |
| Trigonal Pyramidal | $AB_3E$   | 1 | $107^\circ$   | $NH_3: \begin{array}{c} H \\   \\ \ddot{N} \\ / \backslash \\ H \end{array}$ |
| Bent               | $AB_2E_2$ | 2 | $104.5^\circ$ | $H_2O: \begin{array}{c} H \\   \\ \ddot{O} \\   \\ H \end{array}$            |

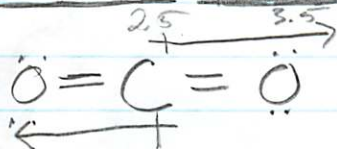
## Polar Bonds

↳ one element is more electronegative than the other.

↳ Difference in electronegativity 0.0-0.3 is non polar covalent. 0.3 → 1.7 is Polar covalent. 1.7 ↑ is Ionic.

## Molecular Polarity

ex:

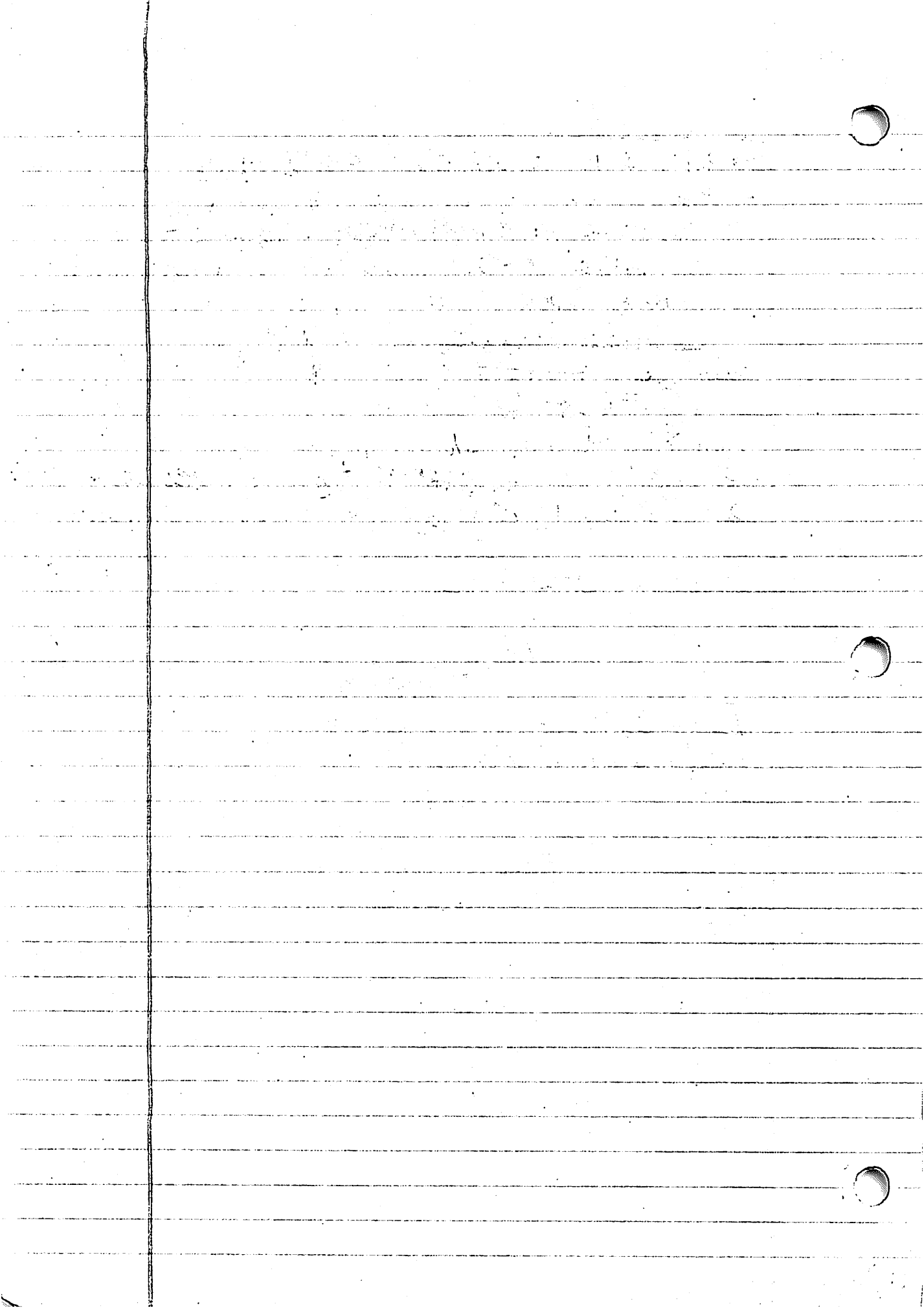


↳ Symmetry in the geometry of the molecule, cancels out polarity making the molecule non polar.

Are the bonds polar

Y N  
↙ ↘ Non-polar molecule  
If yes, is the geometry symmetrical?

Y N  
↙ ↘  
Non Polar Polar





## Intermolecular Forces

- ↳ Attractive forces between molecules.
- ↳ Polar molecules will attract to each other.
- ↳ NOT bonds, just weak forces of attraction
- ↳ Dipole-Dipole Interactions → Attractive forces between polar molecules (dipole  $\rightarrow$ )
- ↳ Dipole → Equal but opposite charge separated by a short distance.
- ↳ Opposite charged ends attract
- ↳ Hydrogen-Bonding (strongest)
- ↳ occurs between OH's

